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Metacognitive Abilities and Socio-Psychological Adaptation of People of Mature Age: Features of Relationships

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Abstract: The analysis is aimed at determining characteristics of relationships between metacognitive abilities and socio-psychological adaptation in homogeneous cluster groups represented by people of mature age. The main research methods were: cluster analysis, which allows us to identify relatively homogeneous groups; "bootstrap" method to check the normality of the distribution. The study also used factor analysis to determine the relationship between the characteristics of metacognitive abilities and socio-psychological adaptation. The total following variance in the factor models (86.24%, 99.77%, and 100%) as well as the levels of predictive consistency ($p \leq 0.01$ to $p \leq 0.05$) reflect the reliability and significance of the results obtained. Data processing and interpretation were carried out using qualitative and quantitative statistical methods: Fisher's angular transformation criterion (φ^*) for comparing two samples according to the occurrence frequency of the effect which is interesting to the researcher; Kruskal-Wallis rank sum test (IBM SPSS Statistics).

The results of the study allow us to talk about ambivalence in the manifestation of metacognitive abilities formation in people of mature age: on the one hand, a general tendency towards a decrease in the development of metacognitive abilities was discovered, on the other hand, an increase in the degree of structural organization of the entire metacognitive system was revealed in the process of growing up, which generally compensates for the natural decline of potential resource capabilities of adults. This ambiguity in the manifestation of metacognitive abilities is reflected in their relationship with indicators of socio-psychological adaptation of adults. The identified features of the relationship in terms of harmony/inconsistency, integrity, and the content of crystallizing factors generally indicate a multidimensional structure of the relationship between metacognitive abilities and socio-psychological adaptation, when only in some cases can we talk about a direct correlation of these variables: a high level of development of metacognitive abilities determines high social-psychological adaptation.

Keywords: *metacognitive abilities, socio-psychological adaptation, structural organization of relationships*

Introduction

Socio-psychological adaptation as an indicator of the effectiveness and efficiency of assimilation of social experience and norms has always aroused the interest of psychologists, educators, sociologists, and philosophers. Adaptation is of particular interest in the modern period, which is characterized by high dynamism, emergence of new technologies, intensity of information flow, and an increase in the number of situations of uncertainty, which requires a prompt response to events and quick decision-making. These social challenges require the manifestation of flexibility, openness to new experiences, quick orientation in the information field, i.e. manifestation of a high level of socio-psychological adaptation. And if the younger generation quickly adapts to the challenges of our time, then adults, due to age-related, functional, mental and psychophysiological changes, find it difficult to integrate into a new information environment, avoid unusual forms of activity and social contacts, which leads to violations of socio-psychological adaptation (Artemenko, Shaiakhmetova and Lintvarev , 2021, Lukianchenko and Pronikova,

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2017). However, the question still remains open as to whether metacognitive abilities can act as a kind of compensatory mechanism that promotes the adaptation of adults, which determined the direction and purpose of this study.

The semantic content of the concept of "adaptation" is presented in psychological literature in different ways: as a process, as a state and as a property (Bogdanov, Galimzianova, Kasianik, Romanova and Zavarzina, 2019). We will consider adaptation as a person's ability to adapt to various requirements and challenges without feeling internal discomfort and conflict with the environment, which ensures success and satisfaction in realizing oneself as a socially active subject (a subject actively involved in the system of social, informational, interpersonal, etc. relations) (Lukianchenko and Pronikova, 2017; Sanina, 2019). The instability of the environment and the polyvariability of changes "triggers" the process of adaptation of the individual, allowing it to "survive" in given circumstances. Taking into account the high intensity of the ongoing processes, adaptation of modern man does not stop and exists in a constant cyclicity of its stages: from awareness of the need (but not readiness) to change one's behavior and assimilation of the values of the new environment (new conditions) to tolerance to new values and behavior patterns and accommodation, i.e. their full recognition and acceptance (Vikhman, Romm and Vilberger, 2018). The criteria for the success of adaptation are external (performance results, intensity of communications, inclusion/integration of the individual into society, etc.) and internal (self-realization of the individual, his emotional comfort, self-attitude, etc.) markers (Volchanskaia, 2019).

It must be emphasized that the success of adaptation depends on many objective and subjective variables. Objective variables include material factors (for example, objects and tools of activity), technogenic factors (the degree of pollution of atmosphere and environment, presence of certain chemicals in the environment, etc.), social factors (the system of social connections and relationships, which includes a person) and others (Vikhman, Romm and Vilberger, 2018). Of particular interest in the context of this study are subjective factors, the spectrum of which ranges from anthropological and psychophysiological to personal and socio-psychological. An analysis of studies of this group of factors showed that the effectiveness of socio-psychological adaptation is influenced by the level of education and gender characteristics (Hsiao, Peng, Lee and Chen, 2023; Leaper and Spears Brown, 2014); emotional and functional states (shame, guilt, depression, feelings of loneliness) (Tangney, 2001), as well as the level of social stress (Vasilenko, 2019); social connections and support (Wickramaratne, Yangchen, Lepow, Patra, Glicksburg, Talati and et al., 2022) ; sovereignty and psychological space of an individual (Astakhova and Martynenko, 2021) ; activity level (Merkusheva, 2019); internal locus of control (Popinako and Goncharova, 2020); social and problem solving skills (Mueser, 1998) and others.

It is important to note that no matter what subjective variables are studied, most researchers agree that the success of social adaptation as a multifactorial process primarily depends on the individual characteristics of an individual, since each person has his own pace, rhythm, and speed of adaptation to the environment (Terziev, 2017). And in this sense, adults, older people a priori "lose" in the success of adaptation, despite their experience, the high level of their social and professional skills, which makes the age factor one of the most important in the study of socio-psychological adaptation.

A number of works note that for adults, due to age-related characteristics (and, above all, a decrease in cognitive functions), maladjustment is more characteristic. Thus, according to individual studies, maladjustment is found in more than 60% of older people (Lukianchenko and Pronikova, 2017). It was found that older people with low and average levels of self-esteem, with a predominance of external locus of control, have a low level of adaptation (Artemenko, Shaiakhmetova and Lintvarev , 2021). It was also revealed that a decrease in indicators of socio-psychological adaptation in adults occurs as the severity of their early maladaptive schemes increases (Bogdanov, Galimzianova, Kasianik, Romanova and Zavarzina, 2019; Aloi, Rania, Sacco, Basile and Segura - Garcia, 2020). Low socio-psychological adaptation is typical for older people with a weak nervous system, with a predominance of dysthymic and pedantic type of accentuation with pronounced introversion (Lukianchenko and Pronikova, 2017), as well as with high rates of loneliness (causing severe depression) (Lee, Pearce, Ajnakina, Johnson, Lewis, Mann and et al., 2021). In turn, successful social adaptation, its structural and functional correlates, prevent emotional and cognitive impairment and protect against the harmful effects of loneliness and depression (Franco - O'Byrne, Gonzalez - Gomez, Morales Sepúlveda, Vergara, Ibañez and Huepe, 2023). It has also been shown that a high level of socio-psychological adaptation, due to the influence of such demographic factors as marriage, self-rated health and a high level of education, is associated with a lower risk of cogni-

tive impairment (however, this relationship is gender specific). (Hsiao, Peng, Lee and Chen, 2023; Ren, Savadlou, Park, Siska, Epp and Sargin 2023). The data obtained suggest that cognitive abilities in general and metacognitive abilities in particular may be associated with the success of socio-psychological adaptation of older people.

Recently, metacognitive abilities and processes are increasingly becoming the subject of modern research, due to which the concept of cognition as a process of information processing is expanding. Describing metacognition as a person's system of knowledge about the features of his own cognitive sphere and the methods of its regulation, J. Flavell (Flavell, 1992) identified four components of metacognitive activity: metacognitive knowledge, experience, goals and strategies. From this position, metacognitive abilities are considered through categories such as metacognitive knowledge and metacognitive regulation, which are generalized into metacognitive involvement (awareness) (Karpov, 2016, Perikova and Byzova, 2022). Many studies of metacognitive abilities show their importance in solving various problems (cognitive and life): for example, the higher the level of metacognitive skills, the greater the tendency to correctly solve a problem, to use adequate strategies, to select logical arguments (Güner and Erbay, 2021). A connection has also been found between hierarchical levels of metacognition, mental health and adaptation of patients (with various psychiatric diagnoses) to social life (Seow, Rouault, Gillan, and Fleming, 2021).

In the context of this study, we are interested in the connection between metacognitive abilities and socio-psychological adaptation. It is noted that a subject with developed metacognitive abilities can correctly assess how well a particular problem has been solved, while developed metacognitions provide opportunities for identifying priority life tasks in such a way that their consistent solution will lead to greater adaptation (Karpov, 2018 (a)). Thus, it can be assumed that the more metacognitively gifted a subject is, the better socially adapted he is overall.

The significant role of metacognitive factors in the process of socio-psychological adaptation is confirmed, for example, by the study of cognitive styles as a structure that ensures involuntary regulation of cognitive activity. In particular, it was found that field dependence and impulsiveness, as cognitive styles, complicate the process of social adaptation of patients (Kulikova, 2014). In turn, cognitive styles such as field independence and cognitive complexity contribute to physiological resistance to stress, positive self-perception, acceptance of others, increase the success of social contacts and social status, and help reduce anxiety. And the cognitive style "rigidity" increases maladaptation: anxiety, lack of acceptance of oneself and others increases, self-esteem and emotional comfort decrease (Barysheva, Matiushichev, and Matiushicheva, 2021).

In general, a developed cognitive resource (including creativity, self-esteem, reflection, emotional intelligence) is positively correlated with the adaptive potential of the individual, ensuring the formation of productive forms and methods of interaction of an individual with the external environment, a formed system of values and attitudes and motives of behavior (Serafimovich and Egorova, 2020; Melnikova, Parfenova and Kholodkova, 2019). However, data were also found that reflect the inversion of individual indicators of cognitive resource in relation to adaptive capabilities (Serafimovich and Egorova, 2020).

It is worth noting that most of the described studies were carried out on samples of adolescence and youth, which makes the problem of ontogenetic development of metacognitive abilities and adaptation quite acute and relevant in terms of such age periods as adulthood and aging. For example, in a study by British scientists, metacognitive abilities were studied in an ontogenetic aspect: from adolescence to adulthood (respondents from 11 to 41 years old) (Seow, Rouault, Gillan and Fleming, 2021). Metacognitive abilities were found to improve significantly with age, being highest in late adolescence and plateauing in adulthood. Karpov A.A., Karpov A. A., Chemiakina A. V. (2022) in his experimental studies discovered the age-related dynamics of the structure of metacognitions, the transformation of which occurs in the direction of the implementation of two main functions - compensatory and resource. And if the compensatory function helps to minimize the influence of the negative age factor, then the resource function expands the potential of the individual and promotes his adaptation (Karpov, Karpov and Chemiakina, 2022).

Based on theoretical analysis, some problems can be identified: lack of systematicity in research on the relationship between metacognitive abilities and socio-psychological adaptation; poor development of aspects of monitoring age-related features, since they can act as predictors of an individual's adaptive capabilities at different periods of maturity; inconsistency of data indicating the possibility of inversion in indicators of metacognitive abilities and adaptive capabilities of the individual. Thus, the results of the theoretical analysis made it possible to formulate the purpose of the study: to study the content of

metacognitive abilities (the ability to perform tasks and confidence in the correctness of decisions, developed self-awareness, information processing styles, control and analysis strategies, openness to new experience, etc.) in their relationship with socio-psychological adaptation of people of mature age.

Materials and Methods

At the first stage (on a voluntary basis), 160 respondents aged 45-60 years (average age - 52.5 years) took part in the study. During the initial processing of the received diagnostic data, it was revealed that only 78 respondents gave complete answers and demonstrated readiness for the study. Accordingly, 82 people (51.2% of the total number of subjects) showed signs of leaving the diagnostic situation: they did not perform or only formally performed tests related to the diagnosis of the cognitive position. This fact indicates signs of a closed cognitive position in these respondents, that is, a cognitive strategy that is characterized by intolerance towards unusual information and unwillingness to engage in new situations. In this regard, at the second stage of the empirical study, the sample was further expanded (16 people) to 94 people (51 women, 43 men). All respondents are employed. The areas of their professional activity are: medicine, education, service sector (helping professions).

The study is designed as a deductive-correlational study and uses both quantitative and qualitative methods for data processing and interpreting. The applied cluster analysis makes it possible to group respondents into relatively homogeneous groups based on indicators of their socio-psychological adaptation in adulthood. To identify differences between groups in terms of metacognitive abilities and socio-psychological adaptation, comparative analysis ("cross-sectional method") and statistical criteria are used. Factor analysis is used to identify relationships between the characteristics of metacognitive abilities and socio-psychological adaptation of adults.

In order to identify indicators of metacognitive abilities and socio-psychological adaptation, the following methods and techniques were used: methods for diagnosing socio-psychological adaptation by K. Rogers and R. Dimon; "The ideal computer " (M. A. Kholodnaya and others) to study the cognitive position of respondents; "Constructing the world" (E. Yu. Savin) to study the cognitive position from the point of view of its openness to paradoxical, "impossible" situations, identifying abilities for cognitive decentration; "Cognitive styles of human individuality" (Rusalov V.M., Volkova E.V.) to study the preferred way of solving problems.

Results

The study used cluster analysis to identify homogeneous groups of mature adults. As a result, three groups were identified based on the relationships between diagnostic indicators: No. 1 - 66 people (70% of the total sample); No. 2 – 15 people (16% of the total sample); No. 3 - 13 people (14% of the total sample). According to the bootstrap method, the distribution is not normal (skewness - 1.281, kurtosis - 1.886), but has some tendency towards it.

During the study, significant differences were obtained between cluster groups 1, 2 and 3 according to the Kruskal-Wallis H criterion for the following characteristics: adaptation, self-acceptance, acceptance of others, emotional comfort, internality, desire for dominance (Table 1).

The value of such characteristics of socio-psychological adaptation as adaptation in cluster groups 1 and 2 are at a higher level (average values, respectively, 143.42 and 155.26) than in cluster group 3, which indicates a higher degree of adaptation in these groups to social conditions in compliance with one's own needs, motives, interests and requirements for oneself. Accordingly, respondents of groups 1 and 2 are distinguished by greater personal maturity and a more pronounced potential as a subject of adaptation when interacting with the external environment.

Based on the average values of adaptability and maladaptation, significant differences in maladaptiveness were obtained in all cluster groups. At the same time, the maladaptiveness values of group 3 respondents are in the zone of average/uncertain values (101.46) and are more pronounced in comparison with other groups.

Table 1. *Statistically significant differences in groups 1, 2 and 3 in diagnostic indicators of socio-psychological adaptation according to the Kruskal-Wallis H criterion*

No.	Variables	Empirical significance N empirical (emp.)	p – significance level
1.	Adaptation	59.0911	p ≤0.05
	Adaptability	19.9258	
	Maladaptation	50.0911	
2.	Self-acceptance	50.1593	p ≤0.05
	Self acceptance	32.4823	
	No self-acceptance	47.5659	
3.	Acceptance of others	19.8553	p ≤0.05
	Not accepting others	26.0366	
4.	Emotional comfort	55.0531	p ≤0.05
	Emotional comfort	8.6662	
	Emotional discomfort	56.7938	
5.	Internality	43.0562	p ≤0.05
	Internal control	1.4418	
	External control	46.2342	
6.	Desire for dominance	22.916	p ≤0.05
	Domination	38	p ≤0.01
	Subordinate	35.9228	p ≤0.05
	Escapism	28.7219	p ≤0.05

Respondents in cluster groups 1 and 2 are characterized by a higher degree of satisfaction with their personal characteristics (according to the results of the "Self-Acceptance" scale, 48.51 and 55.8, respectively). They showed a high degree of self-satisfaction, realism in assessing their qualities, abilities and capabilities, understanding and acceptance of the developed values and pressing needs, and agreement with themselves. In group 3, on the "Self-Acceptance" scale, the lowest, in comparison with other groups, indicators of self-acceptance (42.6) and the highest indicators of self-non-acceptance (18.38) were found. It should be noted that respondents in group 2 have very low scores on the "non-acceptance of self" scale (1.8).

Analysis of the indicators of the emotional comfort/emotional discomfort scales allowed us to conclude that in cluster groups 1 and 2 the indicators on the "Emotional Comfort" scale are in the zone of uncertainty (68.59 and 94.93, respectively), but with low values of emotional discomfort (11.13 and 1.46, respectively). Among respondents in group 3, indicators of emotional comfort (20.06) are also in the zone of average values (uncertainty), while their emotional discomfort (24.15) is significantly higher in comparison with other groups.

In the absence of significant differences on the "Acceptance of others" scale, significant differences were found in groups 1, 2 and 3 on the "non-acceptance of others" indicator. These differences are due to low scores in groups 1 (13.56), 2 (10.33) and the result in group 3 (20.84), which in terms of severity is in the zone of average values. We can say that mature people of all cluster groups do not have a pronounced need for communication, interaction, joint activities, however, respondents from cluster groups 1 and 2 are still ready to interact and are less negatively disposed towards others, understanding that people's belief systems and values may not match.

It is important to note that significant differences were found in the dominance indicator: the average values in group 2 (12.06) were significantly higher than in groups 1 (8.57) and 3 (8.84). Accordingly, respondents in groups 1 and 3 have average values for the diagnostic indicator "Subordinate" (15.66 and 22.07, respectively), in contrast to respondents in group 2, who have significantly lower values for the indicator of subordination and executive activity ("Subordinate" - 8.6).

A similar trend was revealed on the "Escapism" scale: cluster groups 1 and 3 are characterized by

average values (10.65 and 14.38, respectively), and group 2 – low, which characterizes respondents of this group as people capable of solving complex tasks and problems without avoiding them. At the same time, the values of the integral indicator of internality among respondents of all three groups have high values (55.01, 55.8, 55 46, respectively), they accept responsibility for the events occurring in their lives; The results of their activities are explained by their behavior, character, and abilities.

Thus, based on the analysis of the diagnostic values of the three cluster groups, we can conclude that the highest degree of socio-psychological adaptation is demonstrated by respondents of the second (2) cluster group, which can be conditionally called "Adapted and included in society," as they are active in solving various problems and situations. Quite a high socio-psychological adaptation is also characteristic of cluster group 1, which can be conditionally called "Adapted, but avoiding difficulties", due to their pronounced passive behavioral strategy in various life situations. The lowest socio-psychological adaptation is characteristic of cluster group 3, which can be called "Poorly adapted and passive" due to their avoidance of involvement in relationships, lack of readiness to overcome problematic situations, and subordinate position.

We can say that in the process of clustering the specifics of the socio-psychological adaptation of people of mature age were determined. This specificity in cluster groups was supplemented by diagnostic results of their metacognitive abilities: cognitive position, severity of decentration, profile of cognitive styles, studied in the second stage of the study.

In the process of comparative analysis of the results of the cognitive position (Table 2) of respondents from three cluster groups, significant differences were obtained (Table 3), characterizing the measure of openness of the cognitive position.

Table 2. *Results characterizing the measure of openness of the cognitive position (open - OPP, closed - ZPP, uncertain - NPP) in cluster groups of respondents with different degrees of adaptation*

1 group – 66 people	**%**	**Group 2 – 15 people**	**%**	**Group 3 – 13 people**	**%**
Quantity. /PP		**Quantity/PP**		**Quantity/PP**	
11 / ZPP	10.6	3 / ZPP	20	2 / ZPP	15.4
26/OPP	37.9	4/OPP	26.7	1/OPP	7.6
29 /NPP	48.5	8 / NPP	53.3	10 / NPP	77

In all groups (1, 2 and 3), an uncertain cognitive position dominates (48.5%, 53.3% and 77%, respectively), which indicates both the potential for openness of the cognitive position and some shortcomings of its formation.

Table 3. *Results of significant differences in the characteristics of the cognitive position (PP) in cluster groups of respondents with different degrees of adaptation (according to the criterion of Fisher's angular transformation - φ *)*

Comparison of PP characteristics in groups	**Coefficient value**	**Significance level**
Open PP (groups 1 and 3)	$\varphi^*_{em.} = 2.518$	p≤0.01
Open PP (groups 2 and 3)	$\varphi^*_{em} = 1.763$	p≤0.05
Uncertain PP (groups 2 and 3)	$\varphi^*_{em.} = 3.092$	p≤0.01

To clarify the results on the formation of openness of the cognitive position, the results of decentration in the identified cluster groups were determined (Table 4).

Table 4. *Results of the severity of decentration as a characteristic of a cognitive position in cluster groups of respondents with varying degrees of adaptation*

1 group - 66 people	%	Group 2 – 15 people	%	Group 3 - 13 people	%
Number/level of decentralization		Number/level of decentralization		Number/level of decentralization	
36 / below average	54.5	5 / below average	33.3	8 / below average	61.6
14/medium	25	8/medium	53.3	1/medium	7.7
16 / above average	20.5	2/above average	13.4	4 / above average	30.7

Basically, decentration was formed at a level below average among respondents of clusters 1 and 3, which indicates the overwhelming majority in these groups of respondents with a low ability to use different ways of describing and analyzing phenomena. The average level of decentration severity prevails in group 2 (in 53.3% of respondents), which may indicate a tendency towards the readiness of these respondents to accept paradoxical and contradictory information without subjective distortions. Decentration results reflecting a level above average are found significantly less frequently in groups. When studying the results, significant differences were obtained in the formation of decentration in cluster groups (Table 5).

Table 5. *Results of significant differences in the formation of decentration in cluster groups of respondents with different degrees of adaptation (according to the criterion of Fisher's angular transformation* - φ *)

Comparison of decentration values between groups	Coefficient value	Significance level
average decentration values between groups 1 and 3	φ*em. = 2.029	p≤0.05
average decentration values between groups 2 and 3	φ* em. = 2.955	p≤0.01
decentration values below average between groups 2 and 3	φ* em. = 2.837	p≤0.01

The results obtained reflect the shortcomings in the formation of decentration in groups of mature people. At the same time, for cluster group 2 "Adaptive and included in society," there is a tendency for a higher frequency of manifestation of average and above average levels of decentration (according to the percentage of respondents), which is a sign of a greater level of development of their conceptual and metacognitive experience, a higher level of intellectual abilities, the presence of a tendency to integrate concepts, an open cognitive position.

This picture is complemented by information about cognitive styles that reflect the development of metacognitive abilities in cluster groups of mature people (Table 6).

To detect the significance of differences in diagnostic indicators in different cluster groups, statistical processing of the results was carried out. Significant differences were found in low values of flexibility/rigidity in group 3 in relation to groups 1 (φ*emp = 2.1, p≤0.05) and 2 (φ*emp = 2.91, p≤0.01), as well as average values in groups 1 and 2 (φ*em = 3.19, p≤0.01). Such property as flexibility is a characteristic of a productive cognitive style, which, accordingly, distinguishes cluster groups 1 and 2 to a greater extent, reflecting the ability of respondents in these clusters to quickly change methods of processing information in a situation of cognitive conflict or problem solving.

The opposite of flexibility is an unproductive style such as rigidity of cognitive control, which reflects rigid adherence to the intended plan and instructions under any circumstances. It characterizes the degree of difficulties that a subject experiences when changing methods of processing information in a situation of solving complex ambiguous problems. This cognitive style, with an overall low expression in all clusters, in group 3 "Poorly adapted and passive" is significantly higher and differs from groups 1 (φ*emp = 2.31, p≤0.01) and 2 (φ*emp = 3.19, p≤0.01).

Table 6. *Diagnostic results characterizing the degree of expression of cognitive styles among respondents in cluster groups*

Style expressiveness	1 group (66 people)	Group 2 (15 people)	3 group (13 people)	1 group (66 people)	2nd group (15 people)	3 group (13 people)
	Quantity / %	Quantity / %	Quantity / %	Quantity / %	Quantity / %	Quantity / %
Cognitive styles						
"Flexibility"				"Rigidity"		
low	8/12.1	0 / 0	2 / 15.4	28 / 42.4	10/66.7	2 / 15.4
average	51 / 77.3	13 / 86.7	9 / 69.2	36 / 57.6	2 / 13.3	10 / 76.9
high	7 / 10.6	2 / 13.3	2 / 15.4	0 / 0	3 / 20	1 / 7.7
"Field independence"				"Field dependence"		
low	0 / 0	0 / 0	0 / 0	0 / 0	13 / 86.7	8 / 61.5
average	62 / 93.9	9 / 60	12 / 92.3	48 / 72.7	2 / 13.3	5 / 38.5
high	4 / 6.1	6 / 40	1 / 7.7	18 / 27.3	0 / 0	0 / 0
"Reflexivity"				"Impulsiveness"		
low	0 / 0	2 / 13.3	2 / 15.4	43 / 65.2	8 / 53.3	3 / 23.1
average	57 / 86.4	4 / 26.7	9 / 69.2	23 / 34.8	7/ 46.7	10 / 76.9
high	9/13.6	9 / 60	2 / 15.4	0 / 0	0 / 0	0 / 0
"Abstract Conceptualization"				"Concrete Conceptualization"		
low	2 / 3.05	0 / 0	0 / 0	4 / 6.1	0 / 0	0 / 0
average	58 / 87.8	9 / 60	12 / 92.3	58 / 87.8	14 / 93.3	8 / 61.5
high	6 / 9.15	6 / 40	1 / 7.6	4 / 6.1	1 / 6.7	5 / 38.5
"Tolerance of Uncertainty"				" Intolerance of Uncertainty "		
low	0 / 0	0 / 0	0 / 0	36 / 54.6	6 / 40	6 / 46.2
average	54 / 81.8	7 / 46.6	9 / 69.2	27 / 40.9	9 / 60	6 / 46.2
high	12 / 18.2	8 / 53.4	4 / 30.8	3 / 4.5	0 / 0	1 / 7.6

A style such as field dependence has average values in all three groups. However, in group 2 its severity is significantly lower in comparison with groups 1 ($\varphi^*emp = 4.52$, $p \leq 0.01$) and 3 ($\varphi^*emp = 3.19$, $p \leq 0.01$) at the level of medium and high values. These facts indicate a less pronounced orientation of respondents in the second cluster towards external signs when solving social problems. Accordingly, respondents in clusters 1 and 3 are characterized by greater trust in external (visual) impressions when assessing what is happening; they have difficulty overcoming its influence, which leads to unproductive processing of information. It should also be noted that in group 2 (40%) there were significantly more respondents, which have a high degree of expression of the property "field independence" as a characteristic of a productive cognitive style.

Impulsivity, as one of the unproductive cognitive styles, is significantly more common in group 3 compared to clusters 1 (φ^* emp. = 2.89, $p \leq 0.01$) and 2 (φ^* emp. = 1.67 $p \leq 0.05$). That is, the most impulsive are the respondents of group 3; they tend to react quickly in a multiple choice situation, while they put forward hypotheses without analyzing all possible alternatives. It was found that the most reflective (at a high level of expression) are the respondents of group 2 in comparison with groups 1 ($\varphi^*emp = 4.545$, $p \leq 0.01$) and 3 ($\varphi^*emp = 2.547$, $p \leq 0.01$).

When considering the individual characteristics of concreteness/abstractness in people of mature age, it is necessary to clarify that these cognitive styles are based on psychological processes such as differentiation and integration of concepts. Based on the research of M.A. Kholodnaya (2023), the pole of "concrete conceptualization" is characterized by insignificant differentiation and insufficient integration of concepts, and accordingly refers to unproductive cognitive styles. In contrast, the "abstract conceptualization" pole involves both high differentiation and high integration of concepts, and is characterized by productivity. Accordingly, mature people in group 2 (40% of respondents) with the highest degree of ad-

aptation are characterized by a high degree of expression of the cognitive style of abstract conceptualization (Table 6) in comparison with groups 1(φ* emp. = 2.64, p≤0.01) and 3(φ* em = 2.13, p≤0.05). These respondents are free from the immediate properties of the situation, are guided by internal experience in explaining the physical and social world, are independent, and creative. 38.5% of respondents in cluster group 3 ("Poorly adapted and passive") have high values of the "Concrete Conceptualization" style, which indicates their tendency towards cognitive simplicity ("black and white" thinking), dependence on status and authority, and intolerance to uncertainty, stereotyped decisions. Their behavior is situational (rather than systemic) in nature, and they are characterized by a low ability to think in terms of hypothetical situations.

The majority of respondents in group 2 (53.4%) have a higher degree of tolerance to unrealistic experience as a productive cognitive style in comparison with groups 1 (φ*em. = 2.64, p≤0.01) and 3 (φ* em. = 1.67, p≤0.05). This cognitive style assumes the possibility of accepting impressions that do not correspond or even contradict a person's ideas, which he evaluates as correct and obvious. Accordingly, respondents from cluster 2 ("Adapted and included in society") are more inclined (compared to other groups) to evaluate experience based on actual characteristics and minimize its formulation in terms of "usual," "expected," and "known."

At the third stage of the study, a factor analysis procedure (principal component method) was carried out. Since cluster groups 2 and 3 are represented by a small number of respondents, in the results of factor analysis we will focus only on the substantive features of the crystallizing factors.

As a result of factorization and rotation in groups 1, 2 and 3 of mature people, factor structures were obtained, containing, respectively, a different number of factors (Table 7)

Table 7. *Crystallizing factors of structural interrelations of characteristics of metacognitive abilities and socio-psychological adaptation in cluster groups (1 - respondents with high degree adaptations, 2 - with most high degree adaptations, 3 – with uncertain degree adaptations) of people pf mature age*

No.	Characteristics	Crystallizing factors in the structures of cluster groups		
		1	2	3
1	Field dependence	.153	.197	.050
2	Field independence	.110	.662 *	**.782 ***
3	Narrow equivalence range	-.128	.611 *	. 4 32
4	Wide equivalence range	.106	.229	-.223
5	Flexibility	-.002	.729 *	**.677 ***
6	Rigidity	-.401	-.302	.214
7	Impulsiveness	.140	.403	-. 4 34
8	Reflectivity	-.472	.189	**.754 ***
9	Specific conceptualization	.034	.719 *	. 4 69
10	Abstract conceptualization	-.119	.893 *	. 4 75
11	Tolerance	.068	.880 *	**.851 ***
12	Intolerance	.008	.031	-.092
13	Adaptability	-.027	.530 *	-.223
14	Maladaptation	-.194	.121	-.475
15	Self-acceptance	.075	.197	-.344
16	Self-rejection	-.212	.362	-.391
17	Acceptance of others	-.168	-.221	.073
18	Rejection of others	.111	-.306	.025
19	Emotional comfort	.140	.885 *	-.276
20	Emotional discomfort	.003	.394	-.168
21	Internal control	-.143	.495	-.378

No.	Characteristics	Crystallizing factors in the structures of cluster groups		
		1	2	3
22	External control	-.003	.105	.088
23	Domination	.361	-.104	.359
24	Stubordination	-.345	-.202	-.419
25	Escapism	.128	-.191	**-.823 ***
26	Adaptation	.179	.142	. 4 14
27	Self-acceptance	.248	-.323	.338
28	Acceptance of others	-.170	.153	-.102
29	Emotional comfort	.048	-.262	-.071
30	Internality	-.064	.160	-.172
31	Desire for dominance	.407	-.049	**.634 ***
32	Objectified cognitive orientation (CO)	**.563***	.000	**.958 ***
33	Subjective CO	.044	-.228	.110
34	Categorical CO	**.574***	.887 *	**.880 ***
35	Actual CO	.122	-.812 *	**.951 ***
36	Cognitive efficiency	.495	-.148	**.967 ***
37	Cognitive position	**.531***	.703 *	**.611 ***
38	Total number of “aspects of the world”	**.848***	.214	**.907 ***
39	Relevance	**.646***	.024	**.711 ***
40	Sophistication	**.757***	.083	**.874 ***
41	Decentration	**.850***	.228	**.889 ***
Factor loading / total variance (%)		12.02 / 86.24	19.68 / 99.78	31.96 / 100

Note: variables with the highest weight included in the crystallizing factor are highlighted in bold and an asterisk (***).** Highlighting the structure of group 1 in the crystallizing factor indicates the loss of variable No. 21 (internal control)

Factor structure in the group 1 (“Adapted but avoiding difficulties”) is significant (variance - 86.24%), but incomplete. The variable “Internal control” was dropped. This fact suggests that in this group the indicator of internal control is not consistent with the indicators of other characteristics. In comparison with the factor structures of other groups, it contains the largest number of factors (11), which reflects the greater differentiation of the results in the group; the presence of one variable in 10 and 11 factors also indicates its instability.

However, the variables of the crystallizing factor are consistent (are in direct relationship): categorical cognitive orientation (CO) (2 – level below average), objectified CO (3.56 – level below average), cognitive position (2.28 – tendency to an uncertain position), decentration (54.5% of respondents – below average), total number of “aspects of the world” (4 – average level), validity (1.25 – average), sophistication (0.65 – average level). It can be concluded that the crystallizing variables of this group reflect the uncertainty of the cognitive position, despite the presence of objectified and categorical signs (signs of an open cognitive position). The presence in the first factor of the variables “Objectified CO” and “Categorical CO”, as well as cognitive decentration of a level below the average against the background of the average severity of the indicators “Reasonableness” and “Sophistication”, characterize respondents of group 1 as people with underdeveloped metacognitive abilities.

In the process of factorization and rotation of the results of Group 2 with a high degree of adaptation a factor structure of 6 factors was received. This structure is significant (variance 99.78%), complete, and stable. The crystallizing factor included the following variables: field independence - (19.46 - tendency to high), narrow range of equivalence - (15 - medium), flexibility (17.13 - tendency to high), specific conceptualization (18.4 - high level), abstract conceptualization (17.53 - high level), tolerance (19.1 - average with a tendency to high), emotional comfort (25.26 - average), categorical CO (1 - low level), actual CO (negative orientation) (2 – low), cognitive position (2.06 – uncertain), adaptability (155.26 – high). There

is a relationship between ten variables, nine of which have a direct direction and one in the opposite direction. The variable "Actual CO" is inversely related to categorical questions (which is theoretically determined) and the type of cognitive position, which enhances the effect of an uncertain cognitive position among respondents in this group. However, the main emphasis, in our opinion, needs to be placed on the severity of the variable "Categorical cognitive orientation (CO)" as a sign of an open cognitive position.

At the same time, the developed cognitive potential of this group (identified on the basis of the prevailing productive cognitive styles) indicates the respondents' tendency to focus on signs that distinguish one object of activity from another; their high sensitivity to details, to nuances in activities; a tendency to clearly define boundaries and precise standards in assessing performance results.

In the process of factorization and rotation of the results of Group 3 "Poorly adapted and passive" a factor structure of 6 factors was obtained. The structure is significant (variance - 100%), complete, stable. This is a group with less pronounced adaptation, with a minimum number of people with an open cognitive position (6%) and a decentration rate below average (61.6% of respondents) in comparison with other groups. The crystallizing factor includes 15 variables: cognitive efficiency (3 - average level), objectified CO (2.69 - average), tolerance (17.77 - average level), cognitive position (uncertain - in 77%), decentration below the average level (61.6%), total number of "aspects of the world" (5 - average), relevance (0.98 - average), sophistication (0.6 - tendency towards average), actual CO (2.7 - average level), categorical CO (1 - low level), desire for dominance (44.15 - level of uncertainty), (-) escapism (14.38 - low level, theoretically determined), field independence (17 - average), flexibility (14.84 - average), reflexivity (15 – average level).

Thus, the crystallizing factor in group 3, including the characteristics of the cognitive position and decentration (the degree of its expression, the total number of "aspects of the world", relevance, sophistication) characterize the respondents of group 3 as people with a pronounced vague cognitive position and unformed decentration in conjunction with the most pronounced desire for dominance.

Discussions

Analyzing the existing structure of scientific knowledge, it was revealed that the socio-psychological adaptation of people of mature age, on the one hand, depends on their involvement in social activities. On the other hand, the basic mental function of a person's adaptation to the environment is intelligence, or rather, metacognitive abilities as stable ways of processing information and acquired experience (Kholodnaia, 2023), as components of metacognition - a particular version of mental self-regulation (Chernokova, 2011).

In the course of empirical research, we obtained significant results about the not always clear relationship between the characteristics of metacognitive abilities and the socio-psychological adaptation of people of mature age. Clustering of these results became the basis for identifying three cluster groups, differing in the degree of socio-psychological adaptation formation. It was found that in cluster group 1, which is the most represented in terms of quantitative composition, the level of adaptation is quite high; in group 2, the highest degree of adaptation was revealed; in group 3 – the least pronounced (uncertain) level of adaptation. The resulting distribution is not normal (skewness - 1.281, kurtosis - 1.886), but tends towards it. In this case, the results in group 1 can be designated as a certain conditional norm for the sample according to the adaptation criterion (in comparison with the greater severity of adaptation in group 2 and less in group 3). The identified trend confirms the existing data that people of adulthood and mature age have a fairly high level of socio-psychological adaptation, due to accumulated social experience and developed metacognitive abilities (Karpov, 2018 (b); Lukianchenko and Pronikova, 2017).

Supplementing the distribution obtained by the level of adaptation with other identified socio-psychological indicators, we can conclude that respondents in cluster group 1 "Adapted, but avoiding difficulties" with an optimally high degree of adaptation, readiness for social contacts, emotional comfort and readiness to accept responsibility for various situations, demonstrate a tendency to avoid difficulties (strategy - "hide and not notice"), to perform activities, i.e. to a rather passive behavioral strategy. This trend is probably due to age-related characteristics of socialization, when people's behavioral and social activity decreases, and "security" mechanisms are activated that help reduce the level of stress and strong emotional experiences (Barysheva, Matiushichev and Matiushicheva, 2021).

Cluster group 2. "Adapted and included in society" is characterized by highly expressed adapt-

ability, self-acceptance, emotional comfort, internality, but most importantly, they tend to show leadership and organizational qualities, taking an active position in decision-making and responsibility in difficult situations.

The lowest socio-psychological adaptation is typical for cluster group 3, "Poorly adapted and passive." They are distinguished by emotional dissatisfaction, lack of self-acceptance, uncertainty, passivity, a desire for isolation in relationships with others (rejection of others), a pronounced executive position and a desire to avoid problems rather than solve them. At the same time, we draw attention to the fact that the quantitative representation of these groups is quite low, which only indicates possible (uncharacteristic for the majority) trends in the socio-psychological adaptation of adults.

The identified features of the development of metacognitive abilities in adults in different cluster groups indicate significant differences in their cognitive attitude to the world, in the variability and variety of ways of understanding, in the ability to take into account different points of view and perspectives, in the methods of involuntary regulation and processing of information. The obtained differences (specifications) in cluster groups are partially consistent with the results of a number of studies. For example, in accordance with individual studies (Kulikova, 2014; Sofologi, M. et al. (2023)), it was found that people of mature age are characterized by such unproductive styles as field dependence, rigidity, impulsiveness, and specific conceptualization. This trend (within the framework of our study) is more typical for respondents in group 3. This group has the smallest number of people with an open cognitive position (7.6%) and the largest number of respondents with a low level of decentration (61.5%). However, a contradictory sign was also found: respondents in this group showed an average level of field independence (in 92.2% of respondents).

At the same time, it was revealed that respondents with the highest adaptation (group 2) are characterized by such productive styles that differ significantly from other groups, such as flexibility (a level with a tendency to high), field independence (40% have a high level and 60% have a medium level expressiveness), abstract conceptualization (40% high level of property expression, 60% average level of property expression), tolerance to unrealistic experience (53.3% - high level of manifestation). Thus, they show independence from the status and authority of the source of information, some differentiation and signs of integration of concepts, while being able to transcend the limits of direct contact with reality and move into the area of more distant temporal, spatial and semantic contexts; they can choose innovative ways to solve a problem. The result is consistent with the study by Serafimovich and Egorova, 2020, which notes that developed metacognitive abilities are associated with tacit knowledge strategies and determine the ability to interact effectively in socially heterogeneous groups (Sofologi, M. et al. (2023)).

Respondents of the largest group 1 are characterized by the greatest reflexivity (at an average level - 86.4% and a high level of expression - 13.6%) against the background of a fairly low level of decentralization (low ability to use different ways of describing and analyzing phenomena). And the predominance in the group of people with constructive cognitive styles (abstract conceptualization and tolerance of uncertainty) is conditionally "compensated" by the frequency of manifestations of such styles as "concrete conceptualization" and field dependence. These data reflect the characteristic tendency for most people of mature age towards inconsistency in the manifestation of metacognitive abilities, when, against the background of a high level of mental and intellectual development, limitations and difficulties in the use of cognitive resources (slowness, differentiation, etc.) can be observed (Karpov A. V., et al. (2022)).

Based on the research of Jiang, et al., 2023, as well as the analysis of the identified factor structures, in our opinion, it makes sense to talk about different signs of the compensatory and resource functions of metacognitive abilities among respondents in cluster groups. Thus, in group 1, the crystallizing galaxy is the coordinated relationship between the characteristics of the average level of cognitive position, decentration, the number of "aspects of the world," relevance and sophistication. This relationship reveals signs of the compensatory function of metacognitions and signs of deficiencies in their resource function (the "Internal control" variable was dropped).

In group 2, the crystallizing basis of the factor structure is field independence, a narrow range of equivalence, flexibility, concrete and abstract conceptualization, tolerance, emotional comfort, categorical cognitive orientation and cognitive position. Thanks to such a resource base, they are able to go beyond the limits of direct contact with reality, can choose non-standard ways to solve a problem, and easily establish various kinds of connections and relationships between objects of activity. In other words, we can talk about the manifestation of signs of creative thinking in them due to the developed convergent and

divergent thinking characteristic of people with developed metacognitive abilities (Saiz and Rivas, 2023).

In group 3, the crystallizing factor includes characteristics of an uncertain cognitive position, insufficiently formed decentration, relevance and sophistication, combined with the desire for dominance against the background of fairly pronounced indicators of field dependence, rigidity, and impulsivity. If they have escapism, emotional discomfort and rejection of others, we can conclude that the resource function of metacognitive abilities is practically not formed in this group, leading to low socio-psychological adaptation and a low level of psychological well-being (Saiz and Rivas, 2023).

Thus, the data obtained complement studies of the age aspect of the relationship metacognitive abilities and socio-psychological adaptation, revealing multidimensional and ambiguous signs, some of which, however, reflect a tendency towards a direct relationship: the higher the metacognitive abilities are developed, the higher the socio-psychological adaptation.

Conclusions

Thus, the relevance of studying the relationship between metacognitive abilities and socio-psychological adaptation of people of mature age is shown.

As a result of clustering of diagnostic data, three groups of respondents with different levels of adaptation were identified: quite high, the highest and uncertain (lower). The structure of relationships between the characteristics of socio-psychological adaptation and metacognitive abilities in group 1 is incomplete, unstable, and differentiated. Its main characteristic is the uncertainty of the cognitive position, the presence of signs of the compensatory function of metacognitions and signs of deficiencies in their resource function. The structure of relationships in group 2 (with the highest degree of socio-psychological adaptation) is significant, complete and stable. Its specificity is distinguished by the presence of a unique resource base, which ensures the ability to choose non-standard ways to solve a problem and easily establish various kinds of connections and relationships between objects of activity. The structure of relationships in group 3 (with a fairly low degree of socio-psychological adaptation) is also significant, complete, stable and quite specific in its content. It reflects the low level of development of the resource function of metacognitive abilities in this group, leading to lower socio-psychological adaptation compared to other groups.

The discovered invariant relationships between socio-psychological adaptation and meta-cognitive abilities of people of mature age give grounds to draw the following conclusions:

mature people are characterized by fairly high socio-psychological adaptation, which is due to their experience of socialization;

a tendency towards a decrease in the development of metacognitive abilities in people of mature age was discovered, which may be due to difficulties and limitations in the use of cognitive resources (slowness, differentiation, etc.);

A tendency has been revealed to increase in the process of growing up the degree of structural organization of the entire metacognitive system as a whole, which compensates for the natural decrease in the potential of a person's resource capabilities with age.

On the other hand, the data obtained reveal new ambiguous signs and relationships:

- closed cognitive position, low decentration and fairly pronounced cognitive field independence in people with an uncertain degree of adaptation;
- constructive cognitive styles (abstract conceptualization and tolerance of uncertainty), concrete conceptualization and field dependence among respondents who are adapted but avoid difficulties.

These data reflect the novelty and prospects of the research, as well as the characteristic tendency for most people of mature age towards inconsistency in the manifestation of metacognitive abilities, when, against the background of a high level of mental and intellectual development, restrictions and difficulties in the use of cognitive resources can be observed (slowness, differentiation and so on.). The results obtained, in our opinion, create the basis for further research, based on the results of which it is possible to develop highly effective psychotechnologies for the development of socio-psychological adaptation in connection with the metacognitive abilities of people of mature age. In particular, the data obtained in our study provide grounds for practical recommendations: organizing special educational and developmental classes in centers for the elderly (for example, in longevity centers that exist within the framework of special projects for working with people aged 55 years and older). They should be aimed at developing ideas

about metacognitive experience and socio-psychological adaptation, their relationship; promote the development of reflexivity, cognitive position and cognitive decentering; development of conceptual abilities. An important methodological basis for such work should be the principles of humanistic psychotherapy and a reflexive-integrative approach. You can maintain mental activity during classes in different ways: reading together and discussing what you read, learning new skills (from culinary to vocal), intellectual games, solving puzzles, participating in group discussions, etc., which will help maintain one's high quality of life in old age.

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Conflict of interests

The authors declare no conflict of interest.

Author Contributions

Conceptualization, Kibalchenko Irina, Eksakusto Tatiana; formal analysis, Kibalchenko Irina, Eksakusto Tatiana; Data curation, Kibalchenko Irina; methodology, Kibalchenko Irina; writing – original draft preparation, Eksakusto Tatiana; writing – review and editing, Eksakusto Tatiana. All authors have read and agreed to the published version of the manuscript.

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